REMARKS

In the present Office Action, claims 1 and 3-12 were examined. Claims 1 and 3-12 are finally rejected, and no claims are allowed.

By this Amendment, claims 1 has been amended, no claims have been canceled, and no claims have been added. Accordingly, claims 1 and 3-12 are presented for further examination. No new matter has been added. By this Amendment, claims 1 and 3-12 are believed to be in condition for allowance.

Explanation of Above Amendments

The above amendment is made to better define what is meant by the limitation "suitable for forming into an electrical connector." The new limitation provides an objective measure of this physical property. Basis for this limitation can be found at page 4, lines 96 to 100 as well as original claims 13 and 14. No new matter is intended or believed to be included by this limitation. Since this limitation merely sets forth an objective measure of the existing limitation, no new issues are believed to be involved and no change of scope of the claims are believed to be made. Entry of the amendment is thus respectfully requested.

The Invention

The present invention is directed to a brass alloy having improved resistance to stress relaxation as compared to conventional alpha brass alloys. This improved brass alloy consists essentially of an alpha brass base (see page 6, line 148 of the specification) with the addition of controlled amounts of nickel, tin and phosphorous (see page 4, lines 106-107). As embodied in claim 1, the disclosed brass alloy consists essentially of (by weight): 5% to 25% zinc (see page 13, line 304), 0.3% to 2% nickel (see page 6, lines 163-169), 0.15% to 1% tin (see page 8, lines 213-217), 0.03% to 0.35% phosphorous (see page 7, lines 185-189) and less than 0.1% each of silicon and beryllium (see page 14, line 349 to page 15, line 355). Preferably, the weight ratio of nickel to phosphorous should be between 3.5:1 and 7.5:1 (see page 8, lines 192-195). The claimed alloys are further limited to having specific measures of both improved resistance to stress relaxation as well

as adequate electric conductivity (see page 4, lines 96 to 100 and lines 113 to 115, as well as original claims 13 and 14).

Rejections under 35 USC §102

There are no rejections under 35 U.S.C. §102 in the present Office Action.

Rejections under 35 USC §103

The Examiner rejected claims 1, 3 and 6-12 as being obvious and unpatentable in view of either JP5-311,292 or JP7-126,779. Applicants respectfully traverse these rejections for the following reasons.

JP5-311,292 is drawn to a brass alloy having utility as a component for a heat exchanger having a composition, by weight, of 8-20% zinc, 0.3-1.5% nickel, 0.3-1.2% tin, 0.005%-0.20% phosphorous with the balance being copper. The ratio of nickel to phosphorous is disclosed as ranging from 5 to 50, preferably 19.6. Applicants have discovered, as disclosed in Applicant's specification at page 8, lines 204-206, that for electrical connector applications, a nickel:phosphorous ratio of less than 7.5:1 achieves both increased yield strength and enhanced resistance to stress relaxation. This is established with reference to Applicant's Figure 1 and the specification at page 8, lines 207-210, where alloy X, with a nickel to phosphorous ratio of 20:1 has both reduced yield strength and reduced resistance to stress relaxation when compared to alloy Y and alloy Z, also referred to as inventive alloys A and B above, each having a Ni:P ratio of 5:1.

While JP5-311,292 broadly discloses a nickel to phosphorous ratio of between 5:1 and 50:1, there is nothing in the reference to teach or suggest that for electrical connector applications having the combination of presently claimed electro conductive and resistance to stress relaxation properties, a critical maximum nickel to phosphorous ratio is 7.5:1. A prima facie case of obviousness may be rebutted by showing improved performance in a "critical" range that is within a range disclosed in the prior art. In re Geisler, 116 F.3d at 1469-70; In re Woodruff, 919 F.2d 1575, 1578 (Fed. Cir. 1990). Criticality is supported upon a sbowing that the claimed range achieves unexpected results relative to the prior art range. Id. A demonstration of substantially improved unexpected results is sufficient to establish criticality of the claimed range, in the absence of contrary evidence." In re Soni, 54 F.3d at 751.

It is noted that JP5-311,292 discloses comparative alloy 13 in reference Table 1. This alloy has a composition of 17.5% zinc, 0.27% nickel, 0.20% tin, 0.05% phosphorous

and the balance is copper, having a nickel to phosphorus ratio of 5.4:1. Furthermore, the reference discloses in paragraph [0039] that this comparative alloy 13 had inferior strength and stress related corrosion and cracking resistance. The preferred alloys of this reference have a Ni/P ratio of around 20. Therefore, there is nothing in JP5-311,292 to teach or suggest to one skilled in the art to utilize brass alloys at the low end of the claimed nickel to phosphorous ratio to achieve the unexpected results of the Applicant's invention. In other words, the teachings of JP5-311,292, taken as a whole, teach away from the presently claimed upper Ni/P ratio of 7.5:1.

In addition, it should be noted that the process of making an alloy greatly effects the final properties of the alloy. The preferred process described in the present specification by which the present alloy is made is significantly different than the process described in this reference.

In the present Office Action, the Examiner urges that the electrical conductivity properly would be inherent in the alloy taught by JP5-311,292; however, this ignores that the actual example 13 of the reference is judged inferior wherein the claimed alloys now claim a combination of superior properties never realized before by alloys of this type.

Applicants identify that a preferred nickel to phosphorous ratio is 5:1. By contrast, JP5-311,292 teaches that a ratio of 5.4:1 results in undesired characteristics. It is well established that small changes in percentages of the ingredients often produce alloys of totally different characteristics. Aluminum Co. of America v. Thompson Products, Inc., 122 F.2d 796, 799 (6th Cir. 1941) (internal quotations omitted). Such is the case here. Applicants have surprisingly discovered that when the nickel to phosphorous ratio is maintained around 5:1, an alloy with extraordinary resistance to stress relaxation and superior conductivity is created. Accordingly, Applicant's claims should be allowed over JP5-311,292.

There is further noting that the JP5-311,292 reference fails to teach or suggest the applicability of the reference alloys for use as an electrical connector. It is well established that the discovery of an unobvious property inherent in claimed compounds is sufficient to overcome a showing of obviousness. In re Ruschig, 343 F.2d 965, 978 (CCPA 1965) (internal quotations omitted).

JP7-126,779 discloses a composite material having a copper alloy substrate that contains between 0.1 and 15% nickel, 0.1 and 10% tin and 0.005 and 0.5% phosphorous.

From column 1 of page 2 of the Japanese reference, it appears that numerous other elements may be present in amounts of between 0.01 and 40%. Among the voluminous list of other elements is zinc. The broadly disclosed nickel:phosphorous ratios range between 0.2:1 and 3,000:1. There is nothing in the reference to teach or suggest a copper alloy for connector applications in which the nickel to phosphorous ratio is maintained between 3.5:1 and 7.5:1. Rather, in the table at the top of page 5, exemplary alloys 1 and 2 are zinc-free and have nickel:phosphorous ratios between 21.4:1 and 27.3:1. The only other disclosed alloy contains zinc but appears to be free of nickel, tin and phosphorous. There is nothing in the reference to teach or suggest a brass alloy suitable for use as an electrical connector as claimed by the Applicants. Applicant's claims should be allowed over JP7-126,779. In the present Office Action, the Examiner urges that the electrical conductivity characteristic of the alloys taught by reference. However, as mentioned above, this reference does not have actual taught examples of alloys having all of the presently claimed constituents. Thus, it would be impossible to say that this reference would suggest either, let alone both, presently claimed properties. Also, the Examiner urges that "selecting a range [of Ni/P ratio] in a known range by optimization for the best results is within ambit of ordinary skill artisan." However, in the present case, the disclosed range of Ni/P ratio is so large (i.e. 0.2:1 to 3000:1), that the ordinary skilled artisan would have a difficult, if not impossible, task of recognizing that small range as suitable.

The Examiner rejected claims 1, 3-4 and 6-12 as being obvious and unpatentable over JP6-228,684. Applicants respectfully traverse this rejection for the following reasons:

JP6-228,684 discloses a copper alloy useful as an electrical connector that contains zinc, nickel, silicon, tin, iron, phosphorous and either magnesium or calcium. From the abstract of the disclosure, the nickel to phosphorous ratio may range between 0.5:1 and 3,000:1. There is nothing in the reference to teach or suggest the beneficial effect achieved by maintaining the nickel to phosphorous ratio in the range of 3.5:1 and 7.5:1. Applicants' claims should be allowed over the cited reference. The Examiner again urges that optimizations of the Ni/P ratio from the disclosed 0.5:1 to 3,000:1 range to the presently claimed range from 3.5:1 to 7.5:1 is mere optimization and not an unobvious distinction. In actual practice, an ordinary skilled artisan, without the present disclosure would have difficulty finding this narrow range possessed by these superior properties.

The Examiner rejected claims 1, 3-5 and 7-9 as being obvious and unpatentable over either JP4-231,430 or JP5-059467. Applicants respectfully traverse these rejections for the following reasons:

JP4-231,430 discloses a beryllium copper alloy that may contain one or more additional elements. Among the extensive list of elements that can be added are nickel, zinc, tin and phosphorous. As these are optional elements, there is no recognition of maintaining a nickel to phosphorous ratio. However, within the ranges disclosed for these additions is a nickel to phosphorous ratio range of between 0.002:1 and 5,000:1. The reference further teaches 0.1% beryllium as a minimum as opposed to a maximum as claimed in Applicants' claims.

There is nothing in the reference to teach or suggest a copper alloy suitable for use as an electrical connector with a nickel to phosphorous ratio in the range of 3.5:1 to 7.5:1 and a maximum of 0.1% beryllium. Applicants' claims should be allowed over the cited Japanese reference.

The Examiner again urges that optimization of the Ni/P ratio from the above-noted wide range to 3.5:1 to 7.5:1 is mere optimization and not an unobviousness feature. Again, there is nothing in this reference, as in all of the other cited references that would make the ordinary skilled artisan choose a value in this narrow range versus any value outside that narrow range.

JP5-059,467 discloses a copper alloy that contains tin, phosphorous and magnesium. Optionally, the alloy may contain between 0.01 and 15% zinc. There is nothing in the reference to teach or suggest an inclusion of nickel or the benefit achieved to a copper alloy useful as an electrical connector material when nickel and phosphorous are present in specified ratios. Applicants' claims should be allowed over the cited reference. The arguments made with regard to the other references are equally applicable here.

The Examiner rejected claims 1 and 3-12 as being obvious and unpatentable over JP6-179,932. Applicants respectfully traverses this rejection for the following reasons:

This reference discloses a copper alloy containing zinc and magnesium and may further contain one or more of additional elements. Among the specified additional elements are tin, phosphorous and nickel. In addition, zinc may be present in an amount of 0.01-15%. Both nickel and phosphorous are disclosed as optional elements and there is nothing in the reference to teach or suggest that by maintaining a nickel to phosphorous ratio

of between 3.5:1 and 7.5:1 beneficial properties for an electrical connector are achieved. Within the ranges promulgated for nickel and phosphorous, the reference discloses ratios of between 0.0025:1 and 400:1. Applicants' claims should be allowed over the cited reference. The reference teaches that certain optional ingredients may be added including tin, phosphorous and nickel, but does not teach of suggest making alloys with all of those optional ingredients present. The Examiner urges that the presently claimed Ni/P ratio is a mere optimization and not an unobvious feature. However, this reference does not provide any teachings or suggestion of making any specific alloy having Ni and P both present along with all of the other presently claimed alloy constituents. Thus, the Examiner is suggesting optimization of a speculative class of alloys made by this reference.

Accordingly, Applicants submit that none of the references, alone or in combination, anticipate or make obvious the invention as presently claimed and that the application is now in condition for allowance. Therefore, Applicants respectfully requests reconsideration and further examination of the application and the Examiner is respectfully requested to take such proper actions so that a patent will issue herefrom as soon as possible.

If the Examiner has any questions or believes that a discussion with Applicant's attorney would expedite prosecution, the Examiner is invited and encouraged to contact the undersigned at the telephone number below.

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Respectfully submitted,
John F. Breedis, et al.

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